WHAT IS CLAIMED IS:

1. A method of reducing potential interference in an impulse radio receiver, comprising the steps of:

(a) receiving a signal including an impulse signal, the impulse signal including a sequence of impulses;

(b) sampling an impulse in the sequence of impulses at a data sample time to produce a data sample;

(c) sampling the received signal at a plurality of time offsets from the data sample time to produce a plurality of nulling samples corresponding to the data sample; and

(d) combining the data sample with the plurality of nulling samples to produce an adjusted sample.

2. The method of claim 1, further comprising the step of weighting at least one of the nulling samples to produce at least one weighted nulling sample, wherein step (d) comprises combining the data sample with the at least one weighted nulling sample.

3. The method of claim 1, wherein step (c) comprises the steps of:

sampling the received signal at a time offset before the data sample time to produce a first nulling sample in the plurality of nulling samples; and

sampling the received signal at a time offset after the data sample time to produce a second nulling sample in the plurality of nulling samples.

4. The method of claim 3, further comprising the steps of:

weighting the first nulling sample to produce a first weighted nulling sample; and

weighting the second nulling sample to produce a second weighted nulling sample,

wherein step (d) comprises combining the data sample with the first and second weighted nulling samples.

5. The method of claim 1, further comprising the steps of:

deriving a first sampling control signal, wherein step (b) comprises sampling the impulse at the data sample time in accordance with the first sampling control signal; and

deriving a second sampling control signal based on the first sampling control signal, wherein step (c) comprises sampling the received signal at one of the plurality of time offsets from the data sample time in accordance with the second sampling control signal.

6. The method of claim 1, wherein step (c) comprises sampling the received signal at the plurality of time offsets from the data sample time so as to avoid sampling impulse signal energy.

7. The method of claim 1, wherein step (d) has the effect of rejecting potential interference at interference frequencies corresponding to the plurality of sampling time offsets of step (b).

8. A method of reducing potential interference in an impulse radio receiver, comprising the steps of:

(a) receiving a signal including an impulse signal, the impulse signal including a sequence of impulses;

(b) sampling an impulse in the sequence of impulses at a data sample time to produce a data sample;

(c) sampling the received signal at a plurality of time offsets from the data sample time to produce a set of nulling samples corresponding to the data sample;

(d) weighting the set of nulling samples using different sets of weights, thereby producing different sets of weighted nulling samples;

(e) separately combining the data sample with the each of the different sets of weighted nulling samples to produce an adjusted sample corresponding to each of the different sets of weights; and

(f) determining a preferred one of the sets of weights based on a predetermined criteria.

9. The method of claim 8, wherein step (d) comprises:

weighting one of the sets of nulling samples at step (d) such that the corresponding adjusted sample produced at step (e) is the data sample.

10. The method of claim 8, wherein step (f) comprises the steps of:

determining a separate quality metric indicative of an impulse Signal-to-Interference (S/I) level for each of the adjusted samples, whereby the quality metrics represent the predetermined criteria; and

determining the preferred one of the sets of weights and a corresponding adjusted sample based on the quality metrics.

11. The method of claim 8, wherein step (c) comprises the steps of:

sampling the received signal at a time offset before the data sample time to produce a first nulling sample in the plurality of nulling samples; and

sampling the received signal at a time offset after the data sample time to produce a second nulling sample in the plurality of nulling samples.

12. The method of claim 11, wherein step (e) comprises combining the data sample with the first and second nulling samples.

13. The method of claim 8, wherein step (c) comprises sampling the received signal at the plurality of time offsets from the data sample time so as to avoid sampling impulse signal energy.

14. A method of reducing potential interference in an impulse radio receiver, comprising the steps of:

(a) receiving a signal including an impulse signal, the impulse signal including a sequence of impulses;

(b) sampling the sequence of impulses at a sequence of data sample times to produce a sequence of data samples;

(c) sampling the received signal at a plurality of time offsets from each of the data sample times to produce a set of nulling samples corresponding to each of the data samples;

(d) weighting each set of nulling samples with different sets of weights, thereby producing different sets of weighted nulling samples corresponding to each data sample in the sequence of data samples;

(e) separately combining each data sample with the different sets of weighted nulling samples corresponding to the data sample to produce different adjusted samples corresponding to the data sample, thereby producing different sequences of adjusted samples each corresponding to one of the different sets of weights;

(f) determining a separate quality metric for each of the separate sequences of adjusted samples; and

(g) selecting one of a preferred sequence of adjusted samples and a preferred set of weights based on the quality metrics determined at step (g).

15. The method of claim 14, wherein step (d) comprises:

weighting one of the sets of nulling samples such that the corresponding sequence of adjusted samples produced at step (e) is the same as the sequence of data samples.

16. The method of claim 14, wherein the quality metrics are measures of amplitude variance, and wherein:

step (f) comprises determining a separate amplitude variance associated with each of the separate sequences of adjusted samples.

17. The method of claim 16, wherein:

step (g) comprises one of

selecting as the preferred sequence of adjusted samples a sequence of adjusted samples associated with a lowest amplitude variance, and

selecting a set of weights associated with a lowest amplitude variance as the preferred set of weights.

18. The method of claim 14, wherein step (c) comprises sampling the received signal at the plurality of time offsets from each of the data sample times so as to avoid sampling impulse signal energy.

19. A method of reducing potential interference in an impulse radio receiver, comprising the steps of:

(a) receiving a signal including an impulse signal, the impulse signal including a sequence of impulses;

(b) sampling the sequence of impulses at

a first sequence of data sample times to produce a first sequence of data samples, and

a second sequence of data sample times to produce a second sequence of data samples;

(c) sampling the received signal at

a first plurality of time offsets from each of the data sample times in the first sequence of data sample times to produce a set of nulling samples corresponding to each of the data samples in the first sequence of data samples, and

a second plurality of time offsets from each of the data sample times in the second sequence of data sample times to produce a set of nulling samples corresponding to each of the data samples in the second sequence of data samples;

(d) combining

each data sample in the first sequence of data samples with the corresponding set of nulling samples to produce a first sequence of adjusted samples corresponding to the first plurality of time offsets, and

each data sample in the second sequence of data samples with the corresponding set of nulling samples to produce a second sequence of adjusted samples corresponding to the second plurality of time offsets;

(e) determining a separate quality metric for each of the separate sequences of adjusted samples; and

(f) selecting one of a preferred sequence of adjusted samples and a preferred plurality of time offsets based on the quality metrics determined at step (g).

20. The method of claim 19, wherein sampling step (c) further comprises the step of weighting one of the sets of nulling samples with a set of weights to produce a set of weighted nulling samples.

21. The method of claim 20, wherein step (d) comprises the step of combining the set of weighted nulling samples with one of the corresponding data samples to produce one of the adjusted samples.

22. The method of claim 19, wherein the quality metrics are measures of amplitude variance, and wherein:

step (e) comprises determining a separate amplitude variance associated with each of the separate sequences of adjusted samples.

23. The method of claim 22, wherein:

step (f) comprises one of

selecting a sequence of adjusted samples associated with a lowest amplitude variance as the preferred sequence of adjusted samples, and

selecting as the preferred plurality of time offsets a plurality of time offsets associated with a lowest amplitude variance.

24. The method of claim 19, wherein step (c) comprises sampling the received signal at the plurality of time offsets from each of the data sample times so as to avoid sampling impulse signal energy.

25. In an impulse radio adapted to cancel potential interference from a data sample by combining a plurality of nulling samples with the data sample, wherein a time offset exists between the data sample and each of the nulling samples, and wherein the weighted nulling samples are weighted using a set of weights, a method or improving an impulse signal to interference ratio, comprising the steps of: of:

(a) receiving a signal including an impulse signal, the impulse signal including a sequence of impulses;

(b) searching for a preferred set of weights with which to weight the nulling samples; and

(c) reducing interference by combining data samples with weighted nulling samples produced using the preferred set of weights.

26. The method of claim 25, wherein searching step (b) comprises the steps of:

(b)(i) sampling the sequence of impulses at a sequence of data sample times to produce a sequence of data samples;

(b)(ii) sampling the received signal at a plurality of different time offsets from each of the data sample times to produce a set of nulling samples corresponding to each of the data samples;

(b)(iii) weighting each set of nulling samples with different sets of weights, thereby producing different sets of weighted nulling samples corresponding to each data sample in the sequence of data samples; and

(b)(iv) separately combining each data sample with the different sets of weighted nulling samples corresponding to the data sample to produce different adjusted samples corresponding to the data sample, thereby producing different sequences of adjusted samples each corresponding to one of the different sets of weights;

(b)(v) determining a separate quality metric for each of the separate sequences of adjusted samples; and

(b)(vi) selecting one the preferred set of weights based on the quality metrics determined at step (b)(v).

27. In an impulse radio adapted to cancel potential interference from a data sample by combining a plurality of nulling samples with the data sample, wherein a different time offset exists between the data sample and each of the nulling samples, thereby defining a set of time offsets associated with the nulling samples, a method or improving an impulse signal to interference ratio, comprising the steps of:

(a) receiving a signal including an impulse signal, the impulse signal including a sequence of impulses;

(b) searching for a preferred set of time offsets at which to produce the plurality of nulling samples; and

(c) reducing interference by combining data samples with nulling samples produced using the preferred set of time offsets.

28. The method of claim 27, wherein searching step (b) comprises the steps of:

(b)(i) sampling the sequence of impulses at

a first sequence of data sample times to produce a first sequence of data samples, and

a second sequence of data sample times to produce a second sequence of data samples;

(b)(ii) sampling the received signal at

a first plurality of time offsets from each of the data sample times in the first sequence of data sample times to produce a set of nulling samples corresponding to each of the data samples in the first sequence of data samples, and

a second plurality of time offsets from each of the data sample times in the second sequence of data sample times to produce a set of nulling samples corresponding to each of the data samples in the second sequence of data samples;

(b)(iii) combining

each data sample in the first sequence of data samples with the corresponding set of nulling samples to produce a first sequence of adjusted samples corresponding to the first plurality of time offsets, and

each data sample in the second sequence of data samples with the corresponding set of nulling samples to produce a second sequence of adjusted samples corresponding to the second plurality of time offsets;

(b)(iv) determining a separate quality metric for each of the separate sequences of adjusted samples; and

(b)(v) selecting one of a preferred sequence of adjusted samples and a preferred plurality of time offsets based on the quality metrics determined at step (b)(iv).

29. A method of reducing potential interference in an impulse radio, comprising the steps of:

(a) receiving a signal including an impulse signal, the impulse signal including a train of impulses spaced in time from one another;

(b) interference filtering the received signal to produce a plurality of separate filtered received signals, each having a corresponding impulse Signal-to-Interference (S/I) level; and

(c) selecting a preferred one of the separate filtered received signals corresponding to a highest impulse S/I level from among the plurality of filtered received signals.

30. The method of claim 29, wherein step (b) comprises the step of:

filtering the received signal using a plurality of separate interference filters, each producing a corresponding one of the separate filtered received signals.

31. The method of claim 29, wherein the filtering of the received signal to produce each of the separate filtered received signals in step (b) comprises the steps of:

sampling the impulse signal at a data sample time to produce a data sample;

sampling the received signal at one or more time offsets from the data sample time to produce one or more nulling samples; and

combining the data sample with the one or more nulling samples to produce an adjusted sample representing the respective filtered received signal.

32. The method of claim 29, wherein step (c) comprises the steps of:

determining a separate quality metric indicative of the impulse S/I level for each of the separate filtered received signals; and

selecting the preferred one of the separate filtered received signals based on the quality metrics.

33. The method of claim 32, wherein step (c) comprises the step of:

determining a separate amplitude variance, representing the quality metric corresponding to each of the filtered received signals, for each of the filtered received signals.

34. The method of claim 33, wherein step (c) further comprises the step of:

selecting the preferred one of the filtered received signals based on the amplitude variances.

35. The method of claim 29, wherein step (b) comprises filtering interference in the received signal so as to avoid filtering the impulse signal.

36. An impulse radio receiver subsystem for reducing potential interference in a received signal, the received signal including an impulse signal, the impulse signal including a train of impulses, comprising:

a sampler to sample an impulse in the sequence of impulses at a data sample time to produce a data sample;

a plurality of samplers to sample the received signal at a plurality of time offsets from the data sample time to produce a plurality of nulling samples corresponding to the data sample; and

a combiner to combine the data sample with the plurality of nulling samples to produce an adjusted sample.

37. The receiver subsystem of claim 36, further comprising:

a weighting unit to weight at least one of the nulling samples to produce at least one weighted nulling sample, the combiner being adapted to combine the data sample with the at least one weighted nulling sample.

38. The receiver subsystem of claim 36, wherein

one of the plurality of samplers is adapted to sample the received signal at a time offset before the data sample time to produce a first nulling sample in the plurality of nulling samples; and

another one of the plurality of samplers is adapted to sample the received signal at a time offset after the data sample time to produce a second nulling sample in the plurality of nulling samples.

39. The receiver subsystem of claim 38, wherein:

the weighting unit is adapted to

weight the first nulling sample to produce a first weighted nulling sample; and

weight the second nulling sample to produce a second weighted nulling sample, and

the combiner is adapted to combine the data sample with the first and second weighted nulling samples.

40. The receiver subsystem of claim 36, wherein the receiver subsystem further comprises:

a first timer adapted to derive a first sampling control signal, the sampler being adapted to sample the impulse at the data sample time in accordance with the first sampling control signal; and

a second timer adapted to derive a second sampling control signal based on the first sampling control signal, the plurality of samplers being adapted to sample the received signal at one of the plurality of time offsets from the data sample time in accordance with the second sampling control signal.

41. The receiver subsystem of claim 36, wherein the plurality of samplers are adapted to sample the received signal at the plurality of time offsets from the data sample time so as to avoid sampling impulse signal energy.

42. The receiver subsystem of claim 36, wherein the combiner rejects potential interference at interference frequencies corresponding to the plurality of sampling time offsets.

43. An impulse radio receiver subsystem for reducing potential interference in a received signal, the received signal including an impulse signal, the impulse signal including a train of impulses, comprising:

a data sampler to sample an impulse in the impulse signal at a data sampling time to produce a data sample;

a plurality of nulling samplers to sample the received signal at a plurality of time offsets from the data sample time to produce a set of nulling samples;

a plurality of weighting units to weight the set of nulling samples using different sets of weights, thereby producing different sets of weighted nulling samples;

a combiner to separately combine the data sample with the each of the different sets of weighted nulling samples to produce a plurality of adjusted samples each corresponding to a different one of the sets of weights; and

a selector to select one of

a preferred one of the plurality of adjusted samples, and

a preferred set of weights

based on a predetermined criteria.

44. The receiver subsystem of claim 43, wherein one of the plurality of weighting units is adapted to produce a set of weighted nulling samples such that the corresponding adjusted sample produced by the combiner is the same as the data sample.

45. The receiver subsystem of claim 43, further comprising a Quality Metric Generator (QMG) to determine a separate quality metric indicative of an impulse Signal-to-Interference (S/I) level for each of the adjusted samples,

whereby the quality metrics represent the predetermined criteria, the selector being adapted to determine one of the preferred set of weights and the preferred one of the adjusted samples based on the quality metrics.

46. The receiver subsystem of claim 43, wherein:

one of the plurality of samplers is adapted to sample the received signal at a time offset before the data sample time to produce a first nulling sample in the plurality of nulling samples; and

another one of the plurality of samplers is adapted to sample the received signal at a time offset after the data sample time to produce a second nulling sample in the plurality of nulling samples.

47. The receiver subsystem of claim 46, wherein the combiner is adapted to combine the data sample with the first and second nulling samples.

48. The receiver subsystem of claim 43, wherein the plurality of samplers are adapted to sample the received signal at the plurality of time offsets from the data sample time so as to avoid sampling impulse signal energy.

49. An impulse radio receiver subsystem for reducing potential interference in a received signal, the received signal including an impulse signal, the impulse signal including a train of impulses, comprising:

a data sampler to sample the received signal at data sampling times to produce a sequence of data samples;

a plurality of nulling samplers to sample the received signal at a plurality of time offsets from each of the data sample times to produce a set of nulling samples corresponding to each of the data samples;

a plurality of weighting units to weight each set of nulling samples with different sets of weights, thereby producing different sets of weighted nulling samples corresponding to each data sample in the sequence of data samples;

a combiner to separately combine each data sample with the different sets of weighted nulling samples corresponding to the data sample to produce different adjusted samples corresponding to the data sample, thereby producing different sequences of adjusted samples each corresponding to one of the different sets of weights;

a Quality Metric Generator (QMG) to determine a separate quality metric for each of the separate sequences of adjusted samples; and

a selector to select one of a preferred sequence of adjusted samples and a preferred set of weights based on the quality metrics produced by the quality metric generators.

50. The receiver subsystem of claim 49, wherein one of the plurality of weighting units is adapted to weight one of the sets of nulling samples such that the corresponding sequence of adjusted samples produced by the combiner is the same as the sequence of data samples.

51. The receiver subsystem of claim 49, wherein the quality metrics are measures of amplitude variance, the QMG being adapted to determine a separate amplitude variance associated with each of the separate sequences of adjusted samples.

52. The receiver subsystem of claim 51, wherein the selector is adapted to select one of:

a sequence of adjusted samples associated with a lowest amplitude variance as the preferred sequence of adjusted samples; and

a set of weights associated with a lowest amplitude variance as the preferred set of weights.

53. The receiver subsystem of claim 49, wherein the plurality of samplers are adapted to sample the received signal at the plurality of time offsets

from each of the data sample times so as to avoid sampling impulse signal energy.

54. An impulse radio receiver subsystem adapted to improve an impulse Signal-to-Interference (S/I) ratio of received signals by combining a data sample with a plurality of weighted nulling samples, comprising:

an interference analyzer to search for and select a preferred set of weights;

a first data sampler adapted to sample an impulse in a sequence of impulses of a received signal at a data sampling time to produce a data sample;

a first plurality of nulling samplers each adapted to sample the received signal at a different time offsets from the data sample time to produce a plurality of nulling samples;

a first plurality of weighting units adapted to weight the plurality of nulling samples using the preferred set of weights to produce a weighted set of nulling samples; and

a first combiner adapted to combine the data sample with each of the weighted nulling samples to produce an adjusted sample having an improved impulse S/I ratio with respect to the data sample.

55. The subsystem of claim 54, wherein the interference analyzer comprises:

a second data sampler to sample the received signal at data sampling times to produce a sequence of data samples;

a second plurality of nulling samplers to sample the received signal at a plurality of time offsets from each of the data sample times to produce a set of nulling samples corresponding to each of the data samples;

a second plurality of weighting units to weight each set of nulling samples with different sets of weights, thereby producing different sets of weighted nulling samples corresponding to each data sample in the sequence of data samples;

a second combiner to separately combine each data sample with the different sets of weighted nulling samples corresponding to the data sample to produce different adjusted samples corresponding to the data sample, thereby producing different sequences of adjusted samples each corresponding to one of the different sets of weights;

a Quality Metric Generator (QMG) to determine a separate quality metric for each of the separate sequences of adjusted samples; and

a selector to select the preferred set of weights based on the quality metrics produced by the quality metric generators.

56. The subsystem of claim 55, wherein the first and second data samplers are the same data sampler.

57. The subsystem of claim 55, wherein the first and second pluralities of nulling samplers are the same plurality of nulling samplers.

58. The subsystem of claim 55, wherein the first and second pluralities of weighting units are the same plurality of weighting units.

59. The subsystem of claim 55, wherein the first and second combiners are the same combiner.

60. An impulse radio receiver subsystem adapted to cancel potential interference from a data sample by combining a plurality of nulling samples with the data sample, wherein a different time offset exists between the data sample and each of the nulling samples, thereby defining a set of time offsets associated with the nulling samples, comprising:

an interference analyzer to search for and select a preferred set of time offsets;

a first data sampler adapted to sample an impulse in a sequence of impulses of a received signal at a data sampling time to produce a data sample;

a first plurality of nulling samplers each adapted to sample the received signal at a different time offset from the data sample time based on the preferred set of time offsets to produce a plurality of nulling samples; and

a first combiner adapted to combine the data sample with each of the nulling samples to produce an adjusted sample having an improved impulse S/I ratio with respect to the data sample.

61. An impulse radio receiver subsystem for reducing potential interference in a received signal, the received signal including an impulse signal, the impulse signal including a train of impulses, comprising:

a filter assembly to filter interference in the received signal to produce a plurality of separate filtered received signals, each having a corresponding impulse Signal-to-Interference (S/I) level; and

a selector to select a preferred one of the separate filtered received signals corresponding to a highest impulse S/I level from among the plurality of filtered received signals.

62. The receiver subsystem of claim 61, wherein the filter assembly includes a plurality of separate interference filters, each producing a corresponding one of the separate filtered received signals.

63. The receiver subsystem of claim 61, wherein each of the plurality of filters is adapted to:

sample the impulse signal at a data sample time to produce a data sample;

sample the received signal at one or more time offsets from the data sample time to produce one or more nulling samples; and

combine the data sample with the one or more nulling samples to produce an adjusted sample representing the respective filtered received signal.

64. The receiver subsystem of claim 61, further comprising a Quality Metric Generator (QMG) to determine a separate quality metric indicative of the impulse S/I level for each of the separate filtered received signals, the selector being adapted to select the preferred one of the separate filtered received signals based on the separate quality metrics.

65. The receiver subsystem of claim 64, wherein the quality metrics are measures of amplitude variance and the QMG is adapted to determine a separate amplitude variance for each of the separate filtered received signals.

66. The receiver subsystem of claim 65, wherein the selector is adapted to select the preferred one of the filtered received signals based on the amplitude variances.

67. The receiver subsystem of claim 61, wherein the filter assembly is adapted to filter interference in the received signal so as to avoid filtering the impulse signal.